

Claims

1. Stabiliser device for a string of drill rods which can rotate about a longitudinal axis of the drill string and is subjected to a force in the axial direction ensuring the centring and guiding of the drill string in a borehole and has a tubular central body having means for connection to a first and a second component of the string of drill rods at a first and a second axial end and at least one external element for contact of the stabiliser with a wall of the borehole, characterised in that the external element for contact of the stabiliser with the wall of the borehole has at least one means for activating a means which co-operates with the wall of the borehole in order to limit the friction between the external contact element of the stabiliser and the wall of the borehole, and that it is mounted on the central body in an axial position which remains fixed at least within a range of values of an axial force exerted between the central body and the external contact element, the extent of which can be fixed at any value whatsoever.

2. Device as claimed in Claim 1, characterised in that the external contact element of the stabiliser is a tubular casing mounted so as to slide in the direction of the axis and to rotate about the axis of the stabiliser on the central body, that the means co-operating with the wall of the borehole is at least one blade integral with the external surface of the external element, and that the means for activation of the means co-operating with the wall of the borehole consists of at least one means for mechanical coupling in rotation between the external casing and the central body of the drill rod, when the external casing is displaced axially relative to the body in the direction of the axis under the effect of forces exerted between the blade of the casing and the wall of the borehole, the casing being retained in a position in which it is freely rotatable on the body about the axis by resilient means for restoring in the direction of the axis which bear by two axial ends on edges perpendicular to the axis both of the central body and of the external casing of the stabiliser and constitute abutments for precise positioning of the external casing relative to the central body of the stabiliser in such a way that resilient restoring means are both compressed simultaneously by displacement of the external casing towards a position of coupling to at least one means for mechanical coupling in rotation.

3. Device as claimed in Claim 2, characterised in that it comprises two devices for restoring in the direction of the axis which are spaced from one another in the direction of the axis and mounted between the central body and the external casing of the stabiliser in such a way as to be pre-compressed when the external casing is in a position where it is freely rotatable about the axis of the stabiliser and both compressed simultaneously when the casing is displaced towards a position of coupling to a device for coupling in rotation with the central body.

4. Device as claimed in Claim 2, characterised in that it comprises a first and a second means for mechanical coupling of the external casing in rotation with the central body of the stabiliser in such a way that during the displacement in the direction of the axis of the external casing under the effect of the axial drilling force exceeding a limiting value, the external casing is coupled by a first end to the first means for coupling to the central body, and that for displacement in an opposite direction in the direction of the axis under the effect of an axial force when the drill rod is being lifted from the borehole exceeding a predetermined limit, the external casing is coupled to the central body by a second end with the second device for mechanical coupling to the central body.

5. Device as claimed in Claim 2, characterised in that the at least one restoring device has at least one helical spring having an axis of compression in the direction of the axis, a first axial end bearing on a ring and a second axial end bearing on a second bearing ring, the bearing rings ensuring bearing of the resilient restoring device at its two axial ends both on a bearing edge of the central body and a bearing edge of the external casing, the bearing rings and the bearing edges constituting abutments for axial positioning of the external casing.

6. Device as claimed in Claim 2, characterised in that each of the means for mechanical coupling in rotation of the central body and the external casing of the stabiliser has a ring having a first set of teeth for engagement with a corresponding set of teeth on the central body and a second set of teeth for engagement with a set of teeth on the external casing.

7. Stabiliser as claimed in Claim 2, characterised in that the central body of the stabiliser has a first element and a second element having means for fixing one to the other end to end in the direction of the axis of the stabiliser and a brace in two parts which are placed end to end in the direction of the axis of the stabiliser and interposed between a first shoulder of the first element of the central body and a second shoulder of the second element of the central body.

8. Device as claimed in Claim 7, characterised in that the external casing is mounted so as to rotate about the axis and to slide in the direction of the axis on the body of the stabiliser by means of at least one bearing interposed between the brace of the central body and the external casing of the stabiliser.

9. Device as claimed in Claim 1, characterised in that it has on at least one side of the external contact element in the direction of the axis of the stabiliser a diametrically widened part of the central body with respect to a nominal diameter of the central body and of the string of drill rods.

10. Device as claimed in Claim 9, characterised in that the parts of the central body which have a widened diameter are of substantially spherical shape and have grooves of helical shape.

11. Device as claimed in Claims 1, characterised in that the contact element of the stabiliser has at least two blades projecting radially on its external surface in a helical arrangement about the axis of the stabiliser between which an inter-blade space is provided, the width of which in a circumferential direction of the stabiliser varies in the axial direction of the stabiliser in such a way as to constitute the means for activation of the means co-operating with the wall of the borehole in order to limit the friction of the stabiliser consisting of a drilling liquid circulating in the direction of the axis of the stabiliser in an annular space between the wall of the borehole and the external surface of the stabiliser, the inter-blade space having the shape of a Venturi in the direction of the axis and of the circulation of the

drilling liquid in such a way as to create an effect of a liquid bearing following the blades of the contact element of the stabiliser.

12. Device as claimed in Claim 11, characterised in that the inter-blade space has in the circumferential direction a variable width along the direction of the axis of the stabiliser and the direction of circulation of the drilling liquid, a first part of the inter-blade space having a circumferential width decreasing in the direction of circulation of the drilling liquid, a second part following the part in the direction of circulation of the drilling liquid having a width which is substantially constant and reduced in order to constitute a throat of the Venturi, and a third part of the inter-blade space having an increasing width for the acceleration of the drilling liquid circulating in the annular space in the borehole and the external contact element of the stabiliser having a diameter increasing in a first section in the direction of circulation of the drilling liquid of the first part of the inter-blade space up to a maximum value.

13. Device as claimed in Claim 11, characterised in that the at least two blades of the external contact element of the stabiliser have an external contact surface without channels for the circulation of drilling liquid.

14. Device as claimed in Claim 11, characterised in that the at least two blades of the external contact element of the stabiliser are machined in order to have channels along the length of the blades and in lateral arrangements for the circulation of the drilling liquid producing an effect of a liquid bearing along the blade.

15. Device as claimed in Claim 1, characterised in that the external contact element of the stabiliser is rigidly joined to the central body and in particular is produced in one piece with the central body.

16. Device as claimed in Claim 11, characterised in that the external contact element of the stabiliser is rigidly joined to the central body and in particular is produced in one piece with the central body.

17. Device as claimed in Claim 1, characterised in that the external contact element has a tubular casing mounted so as to rotate on the central body about the axis of the drill string and of the stabiliser and immobilised in axial translation on the central body.

18. Device as claimed in Claim 11, characterised in that the external contact element has a tubular casing mounted so as to rotate on the central body about the axis of the drill string and of the stabiliser and immobilised in axial translation on the central body.